

MISCELLANEOUS.

The Hexagonal Structure formed in Cooling Beeswax in relation to the Cells of Bees.

To the Editors of the 'Annals and Magazine of Natural History.'

GENTLEMEN,—With regard to the explanation of the hexagonal arrangement of the cells of the honeycomb offered in the November number of 'Natural Science' (pp. 347-350) and in the Ann. & Mag. Nat. Hist. ser. 7, vol. v., Jan. 1900, pp. 121-126, by Messrs. Dawson and Woodhead, I would like to point out that crystalline structure in the wax has no direct influence in producing the hexagonal markings seen on the surface of cooling or cooled wax.

This fact is illustrated in Messrs. Dawson and Woodhead's own experiments, for they remark that "the addition to beeswax of resinous substances gave a more pronounced and bolder outline to the hexagons," though they add that they do not consider this to be necessary for the production of the hexagons.

In point of fact the more nearly homogeneous a substance is, the better are the results obtained. In the case of beeswax the minute acicular crystals do not interfere with the phenomena seen on the cooling surface; but colloidal substances, such as Canada balsam, give the best results.

According to the writer's experience, the hexagonal arrangement of the surface is due entirely to the contraction of the uppermost layer, consequent upon the unequal cooling of that surface. If one take, for example, either beeswax, paraffin-wax, Canada balsam, or any other wax or resin, crystalline or non-crystalline, melt it thoroughly, and examine the surface as it slowly cools, he will see a hexagonal tracery, by reflection, marked out over the surface. If a jet of cold air be projected upon this surface the hexagons instantly contract, and on removing the cooling agent they expand again.

As the outcome of this simple phenomenon, due directly to strain and contraction, we have the interesting structures in igneous rocks known as the columnar, perlitic, and spheroidal.

With regard to the melting of the wax by the bees, this is not easy to understand, since the melting-point of beeswax is 145° F., and, according to our best authorities on this subject, the ordinary temperature of the hive is 65° F., although at times during agitation of the bees this may be increased, but not to the amount required to liquefy the wax.

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